U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
PALM SPRINGS-SOUTH COAST FIELD OFFICE

AMENDED ENVIRONMENTAL ASSESSMENT
EA Number CA-660- 01- 50

DATE:	October 5, 2001
TITLE / PROJECT TYPE:	Programmatic Peninsular Ranges Bighorn Sheep Research
PROGRAM ELEMENT:	JP-Special Status Species Recovery and Conservation Actions
BLM OFFICES:	Palm Springs-South Coast Field Office 690 W. Garnet Avenue, P.O. Box 581260 North Palm Springs, CA 92258-1260 El Centro Field Office 1661 S. 4th Street El Centro, CA 92243
PROPONENT:	Bighorn Institute California Department of Fish and Game San Diego Zoological Society - Center for Reproduction of Endangered Species

LOCATION OF PROPOSED ACTION: Peninsular Ranges in Riverside and Imperial Counties, including: the Santa Rosa, San Jacinto, and San Ysidro Mountains

LAND USE PLAN CONFORMANCE and Other Regulatory Compliance:

In accordance with Title 43 Code of Federal Regulations 1610.5-3, the proposed action and alternatives are in conformance with the following BLM approved land use plan: *California Desert Conservation Area Plan* (CDCA, 1980, as amended). The BLM is in the process of preparing an amendment to the CDCA Plan to ensure consistency with the Coachella Valley Multiple Species Habitat Conservation Plan (CVMSHCP) and conformance with the *Recovery Plan for the Bighorn Sheep in the Peninsular Ranges, California* (October, 2000). The CVMSHCP and CDCA Plan Amendment will include research guidelines when completed and implemented. Upon completion, the CDCA Plan Amendment for the Coachella Valley Multiple Species Habitat Conservation Plan will supercede this EA. The proposed action is in conformance with Peninsular Ranges bighorn sheep Recovery Plan. The no action alternative is not in conformance with the Recovery Plan.

The proposed action may result in take of individuals of the federally listed Peninsular Ranges bighorn sheep. Formal consultation with the U. S. Fish and Wildlife Service (USFWS) conducted in accordance with Section 7 of the federal Endangered Species Act (ESA 1973 as amended) is required. For individual research permits issued based on this NEPA document, informal consultation with the USFWS will be conducted in conjunction with permits under section 10 (a) 1 (A) of the ESA that the USFWS issues for research activities that result in take of bighorn sheep.

Section 106 of the National Historic Preservation Act, as implemented at 36 CFR Part 800, requires Federal agencies to take into account the effects of their undertakings on historic properties. This process involves determining the area of potential effects (APE) of the undertaking, identifying historic properties within the APE, and assessing the potential for the project to affect historic properties. If the undertaking is found to have the potential to affect historic properties, the criteria of adverse effect must be applied. An adverse effect is found when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location design, setting, materials, workmanship, feeling, or association. If an adverse effect is determined to exist, the agency will consult to resolve the adverse effect. Certain research activities (e.g. landing of helicopters) could result in physical destruction or damage to cultural resources, which is defined as an adverse effect under 36CFR800.5(a)(2)(i). Therefore consultation with the State Historic Preservation Officer and affected Indian tribes is required.

The proposed action may affect areas managed under the Wilderness Act of 1964 and the California Desert Protection Act of 1994. All research activities within wilderness must conform to the provisions of those laws. Since the proposed action may affect federally designated wilderness areas, a Notice of Proposed Action (NOPA) was released on August 22, 2001 for a 30-day public comment period in conformance with BLM California Desert District policy.

NEED FOR THE PROPOSED ACTION

Bighorn sheep (*Ovis canadensis)* in the Peninsular Ranges were listed under the federal Endangered Species Act in 1998 as a distinct vertebrate population in danger of extinction. The US Fish and Wildlife Service published the final *Recovery Plan for Bighorn Sheep in the Peninsular Ranges, California* in October 2000 and in 2001 began implementation of the Recovery Plan. The Recovery Plan lists a number of actions considered necessary for recovery of the population, including research. The proposed action below corresponds with research activities defined in the Recovery Plan.

Research activities conducted on BLM-managed public lands in the CDCA will require the approval of the authorized officer (CDCA Plan, 1999, page 12). This programmatic environmental assessment will cumulatively analyze research efforts affecting the Peninsular Ranges bighorn sheep, and will be the basis for issuing the necessary federal authorizations and permits for research activities on the BLM-managed public

lands, as required per 43 CFR 2920. The BLM-managed lands constitute approximately 28% of the Peninsular Ranges bighorn sheep critical habitat, designated by the USFWS in February 2001.

A variety of factors caused the decline of bighorn sheep in the Peninsular Ranges. Although much has already been learned through bighorn sheep research, knowledge gaps still exist. As the human population of the Coachella Valley continues to increase, the pressures facing bighorn sheep in the Peninsular Ranges will also increase. Therefore, it is important that we continue to learn more about the factors that contributed to the decline of bighorn sheep, and how they relate to one another. Furthermore, it is difficult to predict what future challenges will face Peninsular bighorn sheep, and an increased knowledge of their basic ecology and behavior will help us insure their survival.

Research activities will enhance our knowledge of the Peninsular Ranges bighorn sheep, enable managers to obtain more accurate population estimates in order to predict and respond to population declines quickly, increase management effectiveness, and help enable recovery of bighorn sheep in the Peninsular Ranges.

DESCRIPTION OF THE PROPOSED ACTION and ALTERNATIVES

A. Proposed Action

Under the proposed action, the BLM would issue federal permits per 43 CFR 2920 for use of the BLM-managed public lands for research activities on the federally listed endangered population of Peninsular Ranges bighorn. The BLM lands involved in this research effort constitute approximately 28% of the total research area. To appropriately address cumulative impacts to bighorn sheep, the complete research program presented in the *Recovery Plan for Bighorn Sheep in the Peninsular Ranges*, California (2000, pp 96 - 104) is summarized below and is incorporated into this document by reference.

The following research activities would largely be based on information gathered from radio-collared bighorn sheep. Radio-collared bighorn sheep provide consistent and highly accurate information on location, movement, and distribution. Without the use of radio collars, the information obtained relative to the research tasks described in the Recovery Plan would be less reliable, accurate, and would not be as useful to managers.

Capture operations, to support proposed research would be carried out by the California Department of Fish and Game (CDFG) during the Fall 2001. In total, 30 percent of the bighorn population would be captured throughout the Peninsular Ranges and would be fitted with collars. During 2001, approximately 60 sheep would be equipped with Global Positioning Systems (GPS) units to facilitate relocation, habitat use, and monitor survival. An additional 40 bighorn may be captured and fitted with VHF radio telemetry

collars. Three sheep would be captured in the San Jacinto Mountains, 11 in the Northern Santa Rosa Mountains, 20 south of State Highway 74, and 20 to 24 in the San Ysidro Mountains.

Sheep would be captured via helicopter and airlifted to a processing location where the collars would be attached. Blood, fecal, ectoparasite, and pharyngeal swabs would be collected from all captured bighorn to conduct pathological tests to evaluate the health of the animals. All but three sheep would be returned to the capture site for release. These 3 bighorn would be transported to the Bighorn Institute in Palm Desert and held there pending release with sheep raised at the Bighorn Institute in the San Jacinto Mountains, scheduled for late November or early December 2001. (See item No. 10 for more details).

All mortality would be promptly investigated so that the cause of death can be determined and specific mortality rates can be calculated. For most mortality events, ground crews would retrieve dead sheep. On occasion, helicopters would be used to retrieve dead sheep if topographic features prohibited access. Ground surveys and visual observations would supplement aerial surveys and telemetry studies to further define habitat use patterns and to study reproductive success.

1. **Monitor population status**, including abundance, distribution, recruitment, survivorship and cause-specific mortality. Actions needed to support population status monitoring would include survey by helicopter at least every other year and radio-collaring approximately 30 percent of the estimated ewe population. The 30 percent is needed to allow for a sufficiently accurate estimate of population abundance and to detect recovery or decline reliably.

2. **Develop population models**. Further research is needed to increase knowledge about the ecology of Peninsular Ranges bighorn sheep and factors that influence population viability. Incorporating existing knowledge into population models would provide insight into the ecology of bighorn sheep and the system to which they belong.

3. **Research the relationships between bighorn sheep, mountain lions, mule deer and habitat**. To increase our knowledge of the ecology of Peninsular bighorn sheep, a better understanding of predation, interspecies relationships, and habitat selection is needed. Actions needed to gather information about predator-prey relationships would be primarily ground and aerial observations.

4. **Investigate the relationships between bighorn sheep, coyotes and bobcats**. Predation by coyotes or bobcats may affect the viability of bighorn sheep populations, primarily through predation on lambs. Factors that put bighorn sheep at risk from these predators should be investigated, including the impact of expanding urbanization, use of urban environments and artificial water sources. Actions needed to gather information about prey species would largely rely on ground surveys and aerial observations.

5. **Investigate the efficacy of temporary suppression of natural predation**. Mountain lion predation periodically is the primary cause of death of adult radio-collared bighorn sheep in certain ewe groups in the Peninsular Ranges. Any measures to intervene should be designed so that the effectiveness of various techniques can be evaluated. The presence of lions and other predators in the area of interest should be monitored as part of the investigation using ground surveys and aerial observations.

6. **Research habitat use, selection and dispersal behavior**. Studies would be conducted to gain a better understanding of habitat use patterns and factors underlying habitat selection in the Santa Rosa, San Ysidro, and Vallecito Mountains and Coyote Canyon. Forty-four of the 60 GPS collars would be put on sheep in these areas. Ground and aerial observations would be used as part of these research efforts. In the Santa Rosa Mountains, telemetry locations would be attempted from the ground Tuesday, Wednesday, and Thursday each week. Data would be downloaded 3 times and collars would be retrieved after drop off.

In the San Ysidro and Vallecito Mountains and Coyote Canyon, GPS collars would be remotely downloaded via VHF signal. Additional data would be collected at each bighorn location to measure visibility, forage availability and quality, and fecal samples may be collected to determine forage plant species and pregnancy status of collared females. Reproductive status would also be determined by observing each collared female to determine if she is nursing a young lamb.

7. **Evaluate the effect of human activities on bighorn sheep**. Information is needed on how to manage recreational activities in a manner that does not interfere with bighorn habitat use. GIS would be used in conjunction with eight GPS collared bighorn sheep to determine how habitat selection and use relates to location of hiking trails in the Northern Santa Rosa Mountains. No direct observations or trail user manipulations would occur. Data would be downloaded 3 times. Other methods may be used to determine the relationship between bighorn sheep habitat use and recreational use of the area.

Other research would seek to assess the effects of urbanization on bighorn. The efficacy of fencing to prevent access by sheep to urban areas would be studied. This study would be conducted using four ewes and four rams fitted with GPS collars to monitor their response to fence installation. In addition, lamb mortality would be studied in conjunction with this study. No more than 10 lambs would be captured in the Northern Santa Rosa Mountains and radio-collared at 20-40 days old. There is evidence that at this age no disruption of the maternal-lamb bond would occur (Bighorn Institute, unpublished data). Lambs would be captured using the methods described above. Lambs would be monitored daily and visually observed every 3-5 days for the first 5 months post-capture. Beginning 6 months post-capture, visual observations would be reduced to a minimum of one/week. Lambs would be observed for >45 minutes to record general health, suckling behavior, and activity level.

8. **Research disease and preventive measures**. Continue monitoring the presence and impact of infectious diseases in ewe groups using radio-collared animals. A standardized sampling protocol has been developed and implemented during capture operations. Blood, fecal, ectoparasite, and pharyngeal swabs would be collected from all captured bighorn to conduct pathological tests to evaluate the health of the animals. A standardized necropsy protocol would also be conducted when fresh carcasses can be obtained. Mortalities would be retrieved and transported by ground personnel except when terrain is too difficult to access on foot and helicopters are warranted.

9. **Research genetics of bighorn sheep in the Peninsular Ranges**. Research towards the estimation of the effective population size is a priority, and genetic variability would be directly monitored. DNA samples would be collected from every animal captured in the Peninsular Ranges and from adjacent populations using a standardized sampling protocol.

10. **Develop a long-term strategy and maintain the current capability for captive breeding, reintroduction, and augmentation programs**. Research and identify process and circumstances under which captive breeding, reintroductions, and augmentations may be appropriate and carried out, including the potential introduction of animals from adjoining metapopulations.

Three ewes captured in the Northern Santa Rosa Mountains would be translocated to the San Jacinto Mountains and released with 3 collared sheep raised at the Bighorn Institute. This translocation would augment the San Jacinto Mountains sub-population. Bighorn to be translocated would be held at the Bighorn Institute until their health status has been determined to avert disease transmission. Translocation and/or augmentation would occur in November. Augmentation would occur within the range of the San Jacinto Mountains ewe groups. Blaisdell, and Hurricane Canyons have been suggested for translocation sites. It is possible that sheep would be introduced to the existing ewe group, not necessarily in a separate group north of Chino Canyon. Released sheep would be fitted with GPS collars and monitored twice a month to determine interactions among different groups (captive reared, wild reared, and resident sheep).

B. No Action Alternative

BLM would not issue permits to conduct research on the BLM-managed public lands. Research as described above in the proposed action would continue on the remaining 72% of the study area and not on BLM land. Existing management and use of the habitat would continue subject to applicable statutes, regulations, policy and land use plans.

C. Reduced Research on BLM Land Alternative

The reduced research to BLM land alternative would provide permits for research modified as follows from the Proposed Action: (1) No more than 15 sheep would be captured on the BLM lands; (2) No captures would be allowed in designated Wilderness Areas on BLM land. (3) No lambs would be captured during the lambing season on BLM land to reduce disturbance to ewes and lambs during the lambing season. (4) No more than 5 dead sheep would be retrieved by helicopter from the BLM lands during the lambing season (January 1 -June 30).

D. Increased Research on BLM Land Alternative

This alternative is similar to the Proposed Action except that (1) permits would be issued to researchers that allowed up to 50% more bighorn sheep captures to take place on the BLM lands, (2) population censuses would be conducted each year, instead of every other year, (3) use of helicopters would be allowed to capture and collar lambs during the lambing season outside the northern Santa Rosa Mountains, (4) helicopters would be routinely used to retrieve dead sheep and lambs during and outside the lambing season on BLM-managed lands, instead of relying primarily on ground searches, and (5) theoretical/academic research would be allowed, including manipulative methods that included intensional disturbances.

AFFECTED ENVIRONMENT

A. Area Description

The Peninsular Ranges are a rugged and arid range extending from central Baja California Mexico to San Gorgonio Pass near Palm Springs, CA. The Ranges climb from sea level to over 10,000 feet with a variety of life zones including creosote bush scrub, microphyll woodland, semi-desert chaparral, chaparral and coniferous forest. Bighorn sheep occupy these ranges from near sea level to about 4,000 to 5,000 feet.

Cultural Resources. Cultural resources include sacred or ritual locations as well as sites which contain physical evidence of prehistoric or historic use or occupation. The Peninsular Ranges include portions of the traditional homelands of the Cahuilla and Kumeyaay Indians. Archaeological evidence indicates that humans have occupied the area for at least the past 12,000 years. The project area has not been extensively surveyed so the full extent of its cultural resources is not known. However, many areas are known to contain significant cultural resources, including village sites, areas with extensive middens, and cremation or burial locations. Additional locations which are considered sensitive include sacred sites, ritual sites, trails, and springs.

Recreation. In spring 1998, BLM and CDFG jointly announced initiation of a trail avoidance program in the Santa Rosa and San Jacinto Mountains. Hikers, equestrians, and mountain bikers were requested to voluntarily refrain from using seven trails from January 1 to June 30. Trails subject to the voluntary avoidance program were the North Lykken, Cathedral Canyon, Art Smith, Carrizo Canyon, Bear Creek, Boo Hoff, and Guadalupe Trails.

During the spring of 1999, announcements in *The Desert Sun* regarding the trail avoidance program were published weekly. Signs regarding the program were installed at appropriate locations on the selected trails. In the spring of 2000, BLM employed a Park Ranger to contact trail users at various trailheads and disseminate information about the endangered status of Peninsular Ranges bighorn sheep. The Park Ranger also requested trail users to comply with the voluntary trail avoidance program.

The *Recovery Plan for Bighorn Sheep in the Peninsular Ranges, California* (USFWS, 2000) identifies several trails and areas in the Santa Rosa and San Jacinto Mountains with potential conflicts with lambing from January 1 to June 30, and with water stress from June 1 to September 30 (Table 10). Several of these trails are addressed by the voluntary trail avoidance program, but some are not. Further, the Recovery Plan indicates these trails and areas should be addressed in an interagency trails management plan. Such plan is an element of the Coachella Valley Multiple Species Habitat and Natural Communities Conservation Plan, expected to be completed by August 2002.

On March 16, 2000, a lawsuit was filed in U.S. District Court, Northern District of California, against BLM by the Center for Biological Diversity, Sierra Club, and Public Employees for Environmental Responsibility (plaintiffs). Ultimately, BLM and plaintiffs negotiated a settlement agreement that required BLM to enter into formal consultation on the CDCA Plan as implemented and to implement interim measures to protect bighorn sheep.. These measures included expanding the voluntary trail avoidance program to 11 trails, adding the Clara Burgess, Dunn Road, Bear Creek Oasis, and Morrow Trails to the original list of seven trails. The Court approved the Consent Decree regarding bighorn sheep on March 20, 2001. The interim measures will be in effect until BLM receives a biological opinion from USFWS on the CDCA Plan and implements any applicable terms and conditions, reasonable and prudent alternatives, and/or reasonable and prudent measures of the opinion that require implementation.

Interim measures for bighorn sheep included the deployment of five Sheep Ambassadors whose primary duty is to ensure implementation of the voluntary trail avoidance program for the 11 subject trails from January 1 to June 30 each year. BLM has accomplished this requirement for 2001.

During the period of January to June 2001, Sheep Ambassadors contacted 1,570 individuals regarding the voluntary trail avoidance program. Of these individuals, 922 complied with the request to avoid the subject trails (59%) while 648 chose not to comply (41%). An additional 673 individuals were observed using the subject trails, but were not contacted by Sheep Ambassadors prior to their use.[1]

Wilderness. Within the area affected under this proposed action, the following CDPA wilderness areas are present: Carrizo Gorge (15,700 acres), Coyote Mountains (17,000 acres), Fish Creek Mountains (25,940 acres), Jacumba (33,670 acres), Santa Rosa (51,279 acres, and Sawtooth Mountains (35,080 acres). These wilderness areas were designated by Congress both in recognition of and to preserve their outstanding characteristics of solitude and opportunities for primitive and unconfined recreation. Wilderness designation is intended to retain the primeval character of these lands and no permanent improvements, human habitation, motorized or mechanized equipment or forms of travel are generally allowed. Imprints of man do exist in portions of these areas, but they do not dominate the landscape. BLM's management of these wilderness areas must ensure the integrity of these areas where natural forces are the primary catalyst of change and the effects of man and his works are minimized to the greatest possible extent.

B. Land Status

1. **Land Use Classification**. The Santa Rosa and San Jacinto Mountains are designated as a National Monument. The CDCA Plan Multiple-Use Classification is class L - Limited for most of the public lands in the monument except, in the Santa Rosa Wilderness Area which are classified as C - Controlled.

2. **Valid Existing Rights**. There are several private inholdings within the research area. It is incumbent upon the applicants to obtain landowner permission to conduct research on their lands. Issuance of a BLM permit does not authorize any activities other than those on BLM-managed public lands.

[1] Sheep Ambassadors spent a total of 2,908 hours stationed at trailheads and on trails subject to the voluntary trail avoidance program.

ENVIRONMENTAL CONSEQUENCES

A. Critical Elements

The following table summarizes potential impacts to various elements of the human environment, including the "critical elements" listed in BLM Manual H-1790-1, Appendix 5, as amended. Elements for which there are no impacts will not be discussed further in this document.

Environmental Element	Proposed Action	No Action Alt.	Reduced BLM Alt.	Increased BLM Alt.
Air Quality	No Impact	No Impact	No Impact	No Impact
ACECs	No Impact	No Impact	No Impact	No Impact
Cultural Resources & Native American	Minimal effects with mitigation	No Impact	Minimal effects with mitigation	Minimal effects with mitigation
Farmlands/ Floodplains	No Impact	No Impact	No Impact	No Impact
T&E Animal Species	See discussion below	See discussion below	See discussion below	See discussion below
T&E Plant Species	No Impact	No Impact	No Impact	No Impact
Invasive Species	No Impact	No Impact	No Impact	No Impact
Solid/Hazard. Waste	No Impact	No Impact	No Impact	No Impact
Water Quality	No Impact	No Impact	No Impact	No Impact
Wetlands/Riparian	No Impact	No Impact	No Impact	No Impact
Wild & Scenic Rivers	No Impact	No Impact	No Impact	No Impact
Wilderness	Negative Impact	No Impact	No Impact	Negative Impact
Environmental Justice & Risk to Children	No Impact	No Impact	No Impact	No Impact

B. Discussion of Impacts

1. **Proposed action**

Impacts to Peninsular Ranges Bighorn Sheep.
One goal listed in the recovery plan is to have 30% of the bighorn sheep population collared. During Fall 2001, approximately 100 sheep (23%) would be collared throughout the Peninsular Ranges. The entire capture and collar effort would take approximately 10 working days. The BLM lands involved in this research effort constitute approximately 28% of the total research area. On average, 28 sheep would be captured on the BLM lands during a maximum period of eight (8) days. Ensuing research following capture would continue for two years.

In addition to captures described above, a maximum of 10 lambs would be captured on BLM land in the Northern Santa Rosa Mountains to support a lamb mortality study. Captures would occur in the spring during approximately five days, or until all lambs were captured. Lambs would be captured and radio-collared at 20-40 days old. Data suggests that at this age no disruption of the maternal-lamb bond would occur (Bighorn Institute unpublished data). After collaring, lambs would be visually observed every 3-5 days for the first 5 months post-capture. Beginning 6 months post-capture, visual observations will be reduced to a minimum of one/week. Lambs will be observed for >45 minutes to record general health, suckling behavior, and activity level.

Capture of wild ungulates causes intense, short-term stress to the animals. Heart rate, body temperature, energy expenditure, hormone levels, and blood pressure have all been shown to elevate under stress (MacArthur et al., 1986, Martucci et al., 1992, Kock et al., 1987). In addition, some temporary disruption of normal movement and social patterns would occur. Sheep not captured, but near the capture area, would also experience stress and habitat shifts due to helicopter disturbance. Aerial telemetry from fixed wing aircraft would have little or no impact to the sheep due to the elevation (above 100 meters) (Krausman and Hervert 1983). Typically, population surveys are conducted via helicopters. The aircraft must be close enough to the animals for the observers to determine sex and age. This is closer than the >100 meters suggested by Krausman and Hervert (1983). In addition, aerial surveys of collared sheep from helicopters may induce short-term stress and cause temporary shifts in habitat use (Bleich et al. 1994). Helicopter disturbance to bighorn sheep may bias estimates of habitat use (Bleich 1993), population size (Bleich et al., 1990), and home-range size (Miller and Smith 1985). Bleich et al., (1994) cautioned investigators to consider the potential effects of aerial sampling on the condition and perhaps reproductive success of large mammals (Murphey et al., 1993 cited in Bleich et al., 1994). Although capture indisputably does cause stress and habitat displacement to bighorn sheep, most captured and collared sheep appear to have few, if any, long-term effects from the capture. Sheep generally resume normal feeding, movement, activity patterns, and social status within a few days of helicopter surveys or capture.

The information gathered from the research could benefit the population and enable researchers to more accurately estimate the population size. Accuracy of population

estimates increase as the number of marked individuals increase (Krebs 1999). The proposed action would result in >20% of the population being marked (collared) in Fall 2001. This marked population would enable researchers to obtain more accurate population estimates and also to detect population declines in the future. Accurate population estimates would enable managers to track recovery progress through time and early detection of population decline would enable managers to respond quickly to disease outbreaks and other stochastic events. Furthermore, collared sheep would be used to develop a sightability index which would be used to more accurately determine population estimates. Thus, fewer sheep would be collared in the future for population estimates. In addition, disease profiling would minimize spread of disease between subpopulations during augmentation. Enhanced knowledge of habitat use patterns could improve land management practices.

Sixty of 100 collars would utilize GPS technology and would collect movement and dispersal data up to 24 hours a day by satellite. Thus, sheep locations can be obtained without an observer on the ground. These data would provide insight into nocturnal movements and habitat use. In addition, these data would provide valuable information for management agencies to better understand sheep movements relative to human activities. A clearer understanding of habitat selection would aid habitat conservation efforts, increase the public's understanding of bighorn sheep ecology, and provide data to support recommendations for human activities in bighorn habitat.

Small populations have substantially higher risk of extinction than larger populations (Berger 1990, Berger 1999, Wehausen 1999). Currently, there are 31 sheep in the San Jacinto Mountains sub-population; historical estimates of this group were as high as 200. There are currently only 8 female sheep of breeding age in the San Jacinto Mountains. The unbalanced sex ratio may cause increased pressure on ewes during the rut and may be impeding the population's growth. Augmentation of 6 adult ewes, 3 captured from the Northern Santa Rosa Mountains and 3 captive-reared from the Bighorn Institute, would be released to increase the size of the San Jacinto Mountain ewe group. These 6 ewes and 3 resident ewes would be equipped with GPS collars to facilitate relocation and survival monitoring. The San Jacinto Mountain herd was augmented in1997 with three captive reared ewes from the Bighorn Institute (Bighorn Institute, unpublished data). Although none of the ewes survived more than 10 months, augmentation helps the population to resist local extirpation. The proposed augmentation of the six ewes equipped with GPS collars will provide important information about survival and dispersal, thereby help improve the success of the augmentation program.

Augmentation is an important tool in endangered species management and recovery. The information gathered from these ewes would provide an assessment of the effects newly introduced animals have on the social structure of resident sheep. In addition, habitat use and survival estimates would be obtained. This information would be valuable for future augmentations.

Augmentation, which includes capture, translocation, and time spent in captivity, would cause stress to the sheep. The translocation of 3 wild reared and 3 captive raised sheep could cause social disruption to the resident sheep in the San Jacinto Mountains. Newly introduced bighorn in New Mexico did not integrate immediately with the resident population and translocated ewes spent an average of 5 months on the fringes of the resident population before integrating (Huddleston-Lorton et al., 2000 In addition, translocated sheep spent may spend less time in suitable habitat and may have an increased risk of predation due to unfamiliar habitat (Huddleston-Lorton et al., 2000). This study would use data obtained by GPS collars to better understand the behavior, group dynamics, and survival of newly introduced bighorn sheep.

Ground observations would occur throughout the study period to support research efforts in the Peninsular Ranges. Radio-tracking from the ground could create minor short term disturbance to animals, depending on the skill of the tracker in avoiding disturbance to sheep. All collared animals would be visually observed at least twice a month to assess health, social status, and behavior. Spotting scopes would be used to reduce and minimize disturbance to bighorn sheep. The proposed population monitoring of bighorn sheep would provide detailed information on causes of bighorn mortality in the Peninsular Ranges.

Causes of lamb mortality are poorly understood. Capturing, collaring, and monitoring bighorn lambs would provide cause-specific mortality data. These data could be used to detect diseases, predation, and urban interface issues, which may limit recruitment and thus retard recovery. Lambs may be more vulnerable to capture and handling related stress than adults due to their age and inexperience. Rates of post-capture lamb mortality could be influenced by capture and handling by increasing susceptibility to disease, predation, injury, and potential abandonment by ewe. Handling time during capture would be limited to less than 12 minutes, lambs would be released at capture site, and released lambs monitored to assess general condition immediately following release. Intensive monitoring could result in interrupted suckling bouts thus resulting in reduced fitness. The proposed action would allow continuation of the lamb mortality study, now in its 4th of 5 years. During the past 4 years, there have been no mortalities directly associated with capture of lambs. Additionally, there is no evidence that there have been any interruptions in suckling bouts or abandonment by ewes during this study to date (Bighorn Institute unpublished data). This population has experienced high lamb mortality for over a decade, and the causes need to be identifed . The risks of this study would be counterbalanced by the information gathered.

Impacts to Cultural Resources. Landing of helicopters could result in physical destruction or damage to cultural resources, which is defined as an adverse effect under 36CFR800.5(a)(2)(i). Structures, features and artifacts could be crushed or disrupted by the weight of helicopters. Prop wash has the potential to disturb the fine soils typical of midden deposits. Activities associated with capturing sheep could disturb the integrity of archaeological sites by breaking or displacing artifacts and features.

In order to avoid adverse effects to significant or sensitive cultural resources, research activities will be prohibited in areas known to contain village sites, sites with extensive

middens, and areas where burials or cremations may exist. In addition, research activities will be prohibited in areas which have the potential to contain significant or sensitive resources. The Kumeyaay and Cahuilla Indians will be consulted in order to determine the potential for effects to sacred or ritual locations. Research activities will also be restricted in these areas.

Impacts to Wilderness - Minimum Requirement Analysis. In wilderness, the governing guidance for any and all research activities is Section 4(b) and (d)(2) of the Wilderness Act. These provisions state that wilderness areas may be utilized for scientific purposes and resource information may be collected if done in a manner compatible with the preservation of wilderness character.

The California Desert Protection Act (CDPA) provides further guidance specific to those wildernesses affected by this action in Section 103(e) and (f). These provisions recognize the authority of the State of California over wildlife and wildlife management within wilderness areas created by the CDPA and authorize the appropriate State agencies to use motorized vehicles in wilderness to carry out that authority. While the motor vehicle provision of 103(f) supercedes what is specifically allowed by the Wilderness Act, it does not absolve BLM's responsibility of ensuring that scientific research in wilderness be carried out in a manner that causes the least impairment to Congressionally recognized wilderness values such as solitude and opportunities for primitive recreation.

In CDPA wildernesses, scientific research involving prohibited acts (landing of aircraft) must meet two criteria: 1) the action is the minimum requirement necessary for the administration of the area for the purposes of the Wilderness Act, and 2) research by CDFG to maintain and restore fish and wildlife populations and the habitats to support such populations (Sec. 103(f) of the CDPA). It should also be noted that the given research must also not be able to be carried out completely outside of wilderness to achieve research goals. Since the whole of Peninsular Ranges Bighorn Sheep habitat in the United States has been designated critical by the USFWS, from a biological perspective the wilderness areas within that habitat have little bearing on the way these animals are viewed with respect to the dynamics of the population or their habitat interactions. Wilderness boundaries are not reflective of either the types or qualities of bighorn sheep habitat or deme locations and movements within the range. It would not be considered reasonable in the context of habitat-wide and population-wide research to severely limit necessary methods of research in some portions of the habitat and not in others. In so doing, the integrity of the research as a whole could be compromised-leading to the need for increased data gathering and potentially longer-term impacts to wilderness as a result. What BLM must do to fulfill its mandates to protect wilderness under the Wilderness Act is to prescribe conditions on helicopter use so as to minimize, as much as is possible, short and long term impacts to both wilderness and the wilderness user while allowing for the orderly and systematic collection of bighorn sheep data throughout its range.

Experience and research have demonstrated that capturing bighorn sheep using a helicopter is one of the most efficient and least stressful to bighorn sheep (Kock et al., 1987, Jessup et al., 1988). Optional methods of capture include chemical immobilization (darting and drugging) which is often conducted via helicopter; baiting and trapping sheep, which in the rough terrain of the Peninsular Ranges would likely be ineffective; and capturing using a net gun from the ground, which again, in the rough terrain of the Peninsular Ranges would likely prove ineffective. Most individual chase times during California Department of Fish and Game captures are less than 3 minutes. The Recovery Plan states that "pursuit of a running animal should not exceed 5 minutes".

Helicopter landings in wilderness associated with sheep captures and relocations should be avoided when possible. If there are alternatives to landing in wilderness when the same goal could be accomplished by landing outside of wilderness, they should be exercised. This should be especially true where researchers are working with a population near or straddling a wilderness boundary. When helicopter landings must occur in wilderness, the aircraft should remain on the ground for the shortest possible time and the frequencies of multiple landings should be kept to the absolute minimum. The windows for research activities involving actual or potential helicopter landings in wilderness should be as short as possible while ensuring the maximum effectiveness of the time required to accomplish the task. These windows should also be confined to weekdays and other times when wilderness users would be least likely to be present. Users of wilderness areas possess a statutory right under law to experience wilderness areas as free from mechanical intrusion and disturbance from mechanized activities as possible just as the Federal government must ensure that bighorn sheep in the Peninsular Ranges are protected and recovered. Under this action, BLM must be able to respond promptly and appropriately to wilderness users who may view helicopter landings associated with research to ensure that the public understands, and has an opportunity to respond to, mechanized intrusions in wilderness areas.

Impacts to Recreation. The proposed action would result in no substantial direct effects to recreation in the Santa Rosa and San Jacinto Mountains, except in the Santa Rosa Mountains Wilderness. Management of trail use would not be modified. There would, however, be increased potential for disturbances to solitude and/or quietude during periods that helicopters are used for capturing and releasing Peninsular Ranges bighorn sheep. Escape from the sights and sounds of the urbanized valley is an important part of the trail experience. Opportunities for solitude in the Santa Rosa Mountains Wilderness, a significant element of the wilderness resource as provided for by law, would particularly be affected, and likely reduced, during these periods of helicopter use.

Helicopter use in support of research activities has been designed to avoid the lambing season, except in the northern Santa Rosa Mountains. Use of helicopters in the northern Santa Rosa Mountains during lambing season may reduce BLM's effectiveness in implementing its voluntary trail closure program during lambing season due to perceptions by trail users. BLM's credibility as a land manager may be negatively affected when all public land uses are not equitably curtailed to minimize

disturbance to bighorn sheep during lambing season. While compliance with the voluntary trail avoidance program through direct contact with individuals by Sheep Ambassadors was moderate for 2001 (59%), it is reasonable to anticipate that compliance with the program could diminish if the public perceives the voluntary closure program to reduce disturbance to bighorn sheep during lambing as unreasonable.

2. **No Action Alternative**.

No impacts to BLM lands and resources would occur. However research efforts would be hampered, and as an indirect result of prohibiting research on BLM lands, less accurate and useful information would be available to sheep managers which could lead to adverse impacts to the sheep. The public may perceive BLM actions to minimize impacts to bighorn sheep by curtailing all land uses on the BLM-managed lands as an equitable compromise. Administration of the voluntary trail avoidance program may be more successful.

3. **Reduced Research on BLM Land Alternative**.

While impacts to BLM managed lands would be reduced, these impacts would be shifted to non-BLM lands. Capture operations could occur over a longer period of time to avoid capturing sheep on BLM land. This alternative could reduce the quantity and quality of information obtained and could result in reduced management options. In addition, limiting the number of bighorn sheep captured on BLM-managed public lands may decrease the accuracy of population estimates. The number of animals with radio-collars increases accuracy of population estimates. In addition, the animals collared need to be distributed somewhat evenly across the landscape for an accurate population estimate to be made. BLM-managed lands in the Peninsular Ranges represents about 28% of designated critical habitat for bighorn sheep. The reduced impact alternative proposes to allow 15 adult sheep to be captured on BLM land. Out of 80-100 sheep proposed for capture, 15 sheep comprises 15-18% of the total number proposed for capture. This number is proportional to the percent of BLM-managed land within critical habitat.

No lambs would be captured on public land. Impacts to lambs during lambing season on BLM land would be reduced; however these impacts could be displaced to non-BLM managed lands. Lamb mortality is poorly understood and is a critical component of recovery of this population. It is possible that fewer lambs would be captured overall, thereby reducing the quantity and quality of information obtained if lamb captures were prohibited on BLM-managed public land.

Limiting the number of dead bighorn sheep that could be retrieved off of the BLM-managed public lands via helicopter during lambing season would reduce stress to ewes and lambs. Valuable information on the causes of mortality could be lost if the number of mortality retrievals is limited. It is important to note that disturbance would be of short-duration and occasional. Ground monitoring impacts to bighorn sheep would be the same as described in the Proposed Action.

No bighorn would be captured in BLM wilderness areas. This restriction would prevent impacts to wilderness and decrease the amount of research disturbance to sheep in the southern Santa Rosa Mountains. Not including BLM wilderness land in the capture would potentially reduce the reliability of population estimates due to uneven distribution of collared sheep throughout the Peninsular Ranges.

Impacts to recreation would be the same as described for the Proposed Action except that the public may perceive a limited research undertaking on BLM-managed lands as a compromise to minimize impacts to bighorn sheep and therefore more equitable relative to the treatment of other uses. Administration of the voluntary trail avoidance program may be more successful.

Impacts to wilderness values would be avoided. Impacts to cultural resources would be the same as the Proposed Action with same mitigation measures.

4. **Increased Research on BLM Land Alternative**

This alternative could result in more take of bighorn sheep than the Proposed Action. More reliable census information may be obtained. Manipulative human disturbance studies could be conducted as well as more theoretical/academic work that would not necessarily benefit recovery and management of bighorn sheep in the short-term.

Impacts to wilderness would be same as the Proposed Action. Impacts to cultural resources would be the same as the Proposed Action with same mitigation measures.

Overall, multiple use (recreation, rights-of-way etc.) on the BLM-managed lands would be reduced to accommodate the increased take of bighorn sheep on the BLM-managed lands from research activities. Areas may be closed to most other uses to facilitate research. This will require a large and costly law enforcement program to ensure compliance with the area closure.

C. Mitigation Measures

These mitigation measures are the result of a collaborative effort with the interagency recovery team, USFWS, CDFG and comments from the public to ensure research efforts minimize adverse impacts, result in better land management decisions, and promote recovery of the Peninsular Ranges bighorn sheep.

Bighorn Sheep Mitigation Measures. Measures would be taken to minimize stress and disturbance to bighorn resulting from research activities. Research studies would be carefully designed to minimize researcher-induced disturbance, thus reducing bias to data. Specifically, the following measures would be taken:

1. Research proposals must demonstrate to the satisfaction of the BLM authorized officer a public benefit by providing information which will result in better land management decisions and promote recovery of the Peninsular Ranges bighorn sheep. Impacts to bighorn sheep must be the minimum necessary to achieve the

desired information. Research proposals shall be reviewed by the Recovery Team, USFWS and CDFG prior to submission to the BLM. Research proposals shall include research objectives, methods to be employed and timetables.

2. Prior to approval, proponents are required to obtain from the US Fish and Wildlife Service a section 10(a)1(A) permit to conduct research on a Federally listed species. Compliance with all special terms and conditions stipulated by the USFWS section 10(a)1(A) permit is a condition of approval for BLM to authorize research activities on the BLM-managed public lands. A copy of the special terms and conditions is incorporated into this EA as an attachment.

3. Researchers shall submit annual progress reports and a final project report upon completion of the project. Annual progress reports and final project reports shall include information consistent with objectives of the research proposed. This reporting requirement may use the same documentation submitted to the USFWS and CDFG. This information will aid the BLM in managing public lands consistent with recovery objectives and its multiple-use mandate.

4. To determine a sightability index for future populations estimtes, the number of collared animals will be the minimum necessary to achieve reliable statistical results. This will result in require fewer sheep being collared in the future to obtain population estimates.

5. Field personnel would use spotting scopes when feasible to observe sheep from a distance and use natural blinds to reduce risk of being seen by the animal under observation.

6. Collars would be programmed to drop off animal at end of study. This reduces disturbance and impact to the animal by allowing collar to be removed without additional capture and handling.

7. BLM will be notified in advance of the location of capture efforts on the BLM-managed lands. Staff involved with the captures shall be the minimize necessary to accomplish the task. A post capture report shall be submitted which includes a description of the sheep collared, location of collaring efforts, and status of the sheep.

8. Animals would be pursued for no more than five minutes as stipulated in the Section 10(a)1(A) permit.

9. Animals would be blindfolded during handling to reduce stress.

10. Any research which involves capturing and handling of animals must be coordinated with the CDFG. Captures shall adhere to the CDFG procedures outlined in the Wildlife Restraint Handbook (1996), for example sheep may not be hung upside down from helicopters during transport. Some sheep will be will be transported to a processing site by helicopter, and some will be treated on site, depending on specific animal capture considerations to minimize stress on the animals.

11. A vet shall supervise and be available throughout the capture operations.

12. Helicopter surveys and captures would not be scheduled during the lambing season, except for the lamb mortality study.

Cultural Resources. National Register Bulletin No. 29, prepared by the U.S. Department of the Interior, National Park Service, states that "cultural resources are often fragile and... can be easily destroyed by theft, vandalism, and unauthorized public visitation". Section 304 of the National Historic Preservation Act and Section 9(a) of the Archaeological Resources Protection Act (ARPA) support restriction of information regarding the location of cultural resources. In order to minimize impacts to cultural resources in accordance with FLPMA and NEPA, a list of areas of known or potential cultural resource sensitivity will be provided to CDFG for helicopter flights, but will not be made available to the general public. Research activities will be prohibited in these areas.

Private Property and Valid Existing Rights. There are several private inholdings within the research area. It is incumbent upon the applicants to obtain landowner permission to conduct research on their lands. Issuance of a BLM permit does not authorize any activities other than those on BLM-managed public lands. Issuance of a BLM research permit may not encumber nor terminate any validly issued right-of-way, or customary operation, maintenance, repair and replacement activities in such rights-of-way issued in accordance with Section 509(a) and 701(a) of FLPMA.

Recreation.

1. An information program focusing on the role of research in recovery of bighorn sheep will be implemented in conjunction with other aspects of the BLM's outreach effort.

2. Information will be disseminated to the public via the BLM's outreach effort prior to any capture activities.

3. In order to better inform the public of recovery efforts within critical habitat, the BLM will be notified in advance, or at the time of, any mortality retrievals requiring use of a helicopter on BLM-managed lands.

Wilderness.

1. Helicopter pilots will be provided with maps showing wilderness boundaries.

2. Operations involving potential landings in wilderness will be limited to weekdays to avoid high-use periods of the week.

3. Portions of research activities where helicopter landings in wilderness may occur will be limited to no more than 3 consecutive days during a given season.

4. If the pilot or researcher has the real option of landing outside a wilderness boundary when activities are occurring near a wilderness boundary, that option will be taken.

5. At least 24 hours prior to expected landings in wilderness, BLM will be notified of such expected landings, the approximate area of helicopter operation in wilderness (approximate area of operation must be drawn on a map), expected numbers of landings, and expected purposes of landings (i.e. capture, recovery). Submissions will be sent to the appropriate BLM office (Palm Springs or El Centro) and FAX submissions will be acceptable.

6. Every helicopter landing within the boundaries of a wilderness area will be documented. GPS location, time, duration, and purpose of landing, (i.e. capture, release, or emergency) will be sent to the appropriate BLM office (Palm Springs or El Centro) within 24 hours of such landings. FAX submissions will be acceptable.

D. Residual Impacts

Stress to sheep may be reduced as a result of the mitigation measures. This reduction in stress could result from the reduced frequency and intensity of contact, as well as the care taken when capturing, handling, and monitoring the animal. Focused research studies can result in improved management which could ensure the recovery of bighorn sheep in the Peninsular Ranges. The continued presence of bighorn sheep in the Peninsular Ranges of southern California, including wilderness areas, would enhance the recreational experience. In addition, the intrinsic value of wilderness and wild places in the mountains of southern California would be maintained and enhanced by recovery of this bighorn sheep population.

E. Cumulative Impacts

Public lands within delineated critical habitat for Peninsular Ranges bighorn sheep have been affected by varying degrees of human use over many years. Bighorn sheep habitat has been fragmented by highways such as Highway 74 and Interstate 8, encroached on by urban and residential development within and along the periphery of present habitat, and disconnected from other bighorn sheep ranges in the San Bernardino Mountains and Orocopia Mountains, to name a few. The rapid urbanization

occurring in Southern California since World War II has resulted in increasingly deteriorated air quality throughout the habitat. Increased demand for open space and recreation opportunities resulting from increases in population and subsequent loss of open space elsewhere has resulted in increased levels of recreation throughout much of bighorn sheep habitat.

The designation of wilderness areas in large portions of bighorn sheep habitat has resulted in a decrease in potential threats to habitat quality from activities that would result in direct habitat loss, such as mining and OHV travel. The quality of the wilderness areas themselves are affected by remnants of vehicle routes, occasional intrusions of motorized or mechanized activities, either administratively or by the public, and the potential of activities occurring private inholdings. Despite this, these areas are largely pristine. It is not expected that activities resulting from the proposed research would significantly increase the cumulative level of human disturbance occurring in these areas.

Bighorn sheep research in the Peninsular Ranges has been occurring for more than 40 years. Research provides improved management tools crucial for the recovery of threatened and endangered wildlife populations world-wide. Research on Peninsular Ranges bighorn sheep has been identified in the Recovery Plan (USFWS 2000) as critical for the recovery of this population. As such, research is expected to continue. As more information is gathered and more is known about the ecology of bighorn in the Peninsular Ranges, it is hoped that less intensive research will be needed in the future and managers will begin implementing knowledge gained and monitoring results.

Research activities are only one of a myriad of multiple land uses of the BLM-managed public lands. Through the BLM planning process, all of these uses will be taken into account to determine the overall acceptable level of disturbance to bighorn sheep from all public land uses.

PERSONS / AGENCIES CONSULTED:

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Guy Wagner, USFWS
Peninsular Ranges Bighorn Sheep Recovery Team

PREPARED BY:

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LITERATURE CITED

Bleich, V. C. 1993. Sexual segregation in mountain sheep. Ph.D. Thesis. University of Alaska, Fairbanks, Alaska.

Bleich, V.C., R.T. Bowyer, A.M. Pauli, R. L. Vernoy, and R. W. Anthes. 1990. Responses of mountain sheep to helicopter surveys. California Fish and Game 76: 197-204.

Bleich, V. C., R. T. Bowyer, A. M. Pauli, M. C. Nicholson, and R. W. Anthes. 1994. Mountain Sheep *Ovis canadensis* and helicopter surveys: ramifications for the conservation of large mammals. Biological Conservation 70(1): 1-7.

Berger, J. 1990. Persistence of different-sized populations: an empirical assessment of rapid extinctions in bighorn sheep. Conservation Biology 4: 91-98.

Berger, J. 1999. Intervention and persistence in small populations of bighorn sheep. Conservation Biology 13(2): 432-435.

Bureau of Land Management. 1980. California Desert Conservation Area plan. US Department of the Interior.

Etchberger, R.C., P.R. Krausman, and R. Mazaika. 1989. Mountain sheep habitat characteristics in the Pusch Ridge Wilderness Area, Arizona. Journal of Wildlife Management 53: 902-907.

Harris, L.K. 1992. Recreation in mountain sheep habitat. Ph.D. dissertation. University of Arizona, Tucson. 156 pp.

Hass, C. C. 1989. Bighorn lamb mortality: predation, inbreeding, and population effects. Canadian Journal of Zoology 67: 699-705.

Hass, C. C. 1991. Social status in female bighorn sheep (*Ovis canadensis)*: expression, development, and reproductive correlates. Journal of Zoology, London 225: 509-523.

Huddleston-Lorton, R., M.S. Ahlm, and B.C. Thompson. 2000. Demographics, habitat features, and health of Rocky Mountain bighorn sheep in the San Francisco River and Turkey Creek areas, New Mexico. Final Project Report to New Mexico Department of Game and Fish. Contract No. 98-516.37. New Mexico Cooperative Fish and Wildlife Research Unit, Las Cruces.

Jessup. D. A., R. K. Clark, R. A. Weaver, and M. D. Kock. 1988. The safety and cost effectiveness of net-gun capture of desert bighorn sheep (*Ovis canadensis nelsoni)*. Journal of Zoo Animal Medicine 19: 208-213.

Jessup D.A., R.K. Clark, R. A. Weaver, M.D. Kock. 1988. The safety and cost effectiveness of net-gun capture of desert bighorn sheep (*Ovis canadensis nelsoni)*. Journal of Zoo Animal Medicine 19(4): 208-213.

King, M. M. and G. W. Workman. 1986. Response of desert bighorn sheep to human harassment: management implications. Transactions of the 51st North American Wildlife and Natural Resource Conference.

Kock, M.D., D. A. Jessup, R. K. Clark, and C.E. Franti. 1987. Effects of capture on biological parameters in free-ranging bighorn sheep (*Ovis canadesis)*: evaluation of drop-net, drive-net, chemical immobilization, and the net-gun. Journal of Wildlife Diseases 23(4): 641-651.

Krausman, P. R., and J. J. Hervert. 1983. Mountain sheep responses to aerial surveys. Wildlife Society Bulletin 11: 372-375.

Krebs, C. J. 1999. Ecological methodology, second edition. Benjamin/Cummings Publishers, Menlo Park, CA.

L'Heureux, N., M. Lucherini, M. Festa-Bianchet, and J. T. Jorgenson. Density-dependent mother-yearling assocation in bighorn sheep. Animal Behavior 49: 901-910.

MacArthur, R.A., V. Geist, and R.H. Johnston. 1986. Cardiac response of bighorn sheep (*Ovis canadensis canadensis)* to trapping and radio-instrumentation. Canadian Journal of Zoology 64(5): 1197-2000.

Martucci, P. W., D. A. Jessup, G. A. Grant, J.A. Reitan, and W. E. Clark. 1992. Blood gas and catecholamine levels in capture-stressed bighorn sheep. Journal of Wildlife Diseases 28(2): 250-254.

Miller, G. D. and E. L. Smith. 1985. Human activity in desert bighorn habitat: what disturbs sheep? Desert Bighorn Council Transactions 29: 4-7.

Murphey, S.M., R. G. White, B. A. Kugler, J. A. Kitchens, M.D. Smith, and D. S. Barber. 1993. Behavioral effects of jet aircraft on caribou in Alaska. Proceedings of the Noise and Man 1993, ICBN WHO Conference, Nice, France.

Ough, W. D. and J. C. DeVos. 1984. Intermountain travel corridors and their management implications for bighorn sheep. Desert Bighorn Council Transactions 28: 32-36.

Papouchis, C.M., F. J. Singer, and W. Sloan. 2000. Effects of increasing recreational activity on desert bighorn sheep in Canyonlands National Park, Utah. Pages 364-391 *in* Singer, F. J. and M. A. Gudorf *Restoration of bighorn sheep metapopulations in and near 15 national parks: conservation of a severely fragmented species.* USGS Open File Report 99-102, MidContinent Ecological Science Center, Fort Collins, CO.

U.S. Fish and Wildlife Service. 2000. Recovery Plan for Bighorn Sheep in the Peninsular Ranges, California. U.S. Fish and Wildlife Service, Portland, OR. xv+251 pages.

Wehausen J.D. 1999. Rapid extinction of mountain sheep populations revisited. Conservation Biology 13: 378-384.

DEPARTMENT OF THE INTERIOR
U.S. FISH AND WILDLIFE SERVICE

FEDERAL FISH AND WILDLIFE PERMIT

1. PERMITTEE

BIGHORN INSTITUTE
P.O. BOX 262
PALM DESERT, CA 92261-0262

2. AUTHORITY STATUTES
16 USC 1539(A)

REGULATIONS (Attached)
50 CFR 17.22

3. NUMBER
TE002243-0

4. RENEWABLE	5. MAY COPY
[X] YES	[X] YES
[ ] NO	[ ] NO

6. EFFECTIVE	7. EXPIRES *
03/26/2001	03/25/2005

8. NAME AND TITLE OF PRINCIPAL OFFICER (If 81 is a business)
JAMES R DEFORGE
DIRECTOR

9. TYPE OF PERMIT
ENDANGERED SPECIES

10. LOCATION WHERE AUTHORIZED ACTIVITY MAY BE CONDUCTED
ON LANDS SPECIFIED WITHIN THE ATTACHED SPECIAL TERMS AND CONDITIONS.

11. CONDITIONS AND AUTHORIZATIONS:

A. GENERAL CONDITIONS SET OUT IN SUBPART D OF 50 CFR 13, AND SPECIFIC CONDITIONS CONTAINED IN FEDERAL REGULATIONS CITED IN BLOCK #2 ABOVE, ARE HEREBY MADE A PART OF THIS PERMIT. ALL ACTIVITIES AUTHORIZED HEREIN MUST BE CARRIED OUT IN ACCORD WITH AND FOR THE PURPOSES DESCRIBED IN THE APPLICATION SUBMITTED. CONTINUED VALIDITY, OR RENEWAL, OF THIS PERMIT IS SUBJECT TO COMPLETE AND TIMELY COMPLIANCE WITH ALL APPLICABLE CONDITIONS, INCLUDING THE FILING OF ALL REQUIRED INFORMATION AND REPORTS.

B. THE VALIDITY OF THIS PERMIT IS ALSO CONDITIONED UPON STRICT OBSERVANCE OF ALL APPLICABLE FOREIGN, STATE, LOCAL OR OTHER FEDERAL LAW.

C. VALID FOR USE BY PERMITTEE NAMED ABOVE.

D. Further conditions of authoriztion are contained in the attached Special Terms and Conditions.

[X] ADDITIONAL CONDITIONS AND AUTHORIZATIONS ALSO APPLY

12. REPORTING REQUIREMENTS
ANNUAL REPORT DUE: 1/31
See permit conditions for reporting requirements.

ISSUED BY	TITLE	DATE
Jennifer L. O'Brien	CHIEF - ENDANGERED SPECIES	03/26/2001

SPECIAL TERMS AND CONDITIONS FOR
Bighorn Sheep Institute

1. Acceptance of this permit serves as evidence that the permittee understands and agrees to abide by the "General Conditions for Native Endangered and Threatened Wildlife Species Permits," 50 CFR Part 13, 50 CFR 17.22 (endangered wildlife) and 50 CFR 17.32 (threatened wildlife) (copies attached). In addition, the permittee must have any other applicable State and Federal permits prior to the commencement of activities authorized by this permit.

2. The permittee is authorized to take (capture, handle, collect biological samples, radio-collar, survey, and release) the Peninsular bighorn sheep (*Ovis canadensis*) in conjunction with surveys and the collection of biological information and the maintenance of a captive herd for the augmentation of populations in the wild for the purpose of enhancing its survival as specified in the permittee's August 19, 1998, permit request in accordance with the conditions stated below.

3. Permitted activities are restricted to the following geographic areas in California:

   Throughout the species' range.

4. Authorized individuals:

   Only individuals on the attached List of Authorized Individuals (List) are authorized to conduct activities pursuant to this permit. The List, printed on Service letterhead, may identify special conditions or circumstances under which individuals are authorized to conduct permitted activities and must be retained with these Special Terms and Conditions. Each named individual shall be responsible for compliance with the terms and conditions of this permit.

   To request changes to the List, the permittee shall submit written requests to the CFWO. Two copies of the request shall be submitted at least 30 days prior to the requested effective date. The request shall be signed and dated by the permittee and include:

   a. The name of each individual to be appended to the List;

   b. The resume/qualifications statement of each person to be appended to the List, detailing their experience with each species and type of activity for which authorization is requested;

   c. The names and phone numbers of a minimum of two references; and

d. The names of the individuals to be deleted from the List.

Note: This procedure is for personnel changes only. For requests to renew/amend this permit, a complete application must be submitted to the PRO.

5. Taking of the Peninsular bighorn sheep (sheep):

The permittee is authorized to harass, capture, handle, radio-collar, collect biological samples from, and release up to 10 adult sheep and up to 10 lambs per year within the geographic boundaries specified above and within the time limitation specified in the permit. The permittee is also authorized to survey sheep in the Peninsular Ranges from the ground, in a helicopter, or a fixed-wing aircraft to fulfill research agreements with the Service and California Department of Fish and Game (CDFG). In addition, the permittee is authorized to capture up to two lambs, in any 2 year period, to be taken into captivity for breed stock at the Bighorn Institute. These activities may take place within the geographic boundaries specified above and the time limitation specified in the permit, provided that:

a. All activities associated with this permit must comply with the conditions outlined in the most current Memorandum of Understanding between the Bighorn Institute and CDFG.

b. All activities conducted under this permit shall be organized and managed to minimize disturbance to sheep. This includes minimizing the frequency and duration of all survey and capture activities necessary to achieve the specific objectives of those activities.

i. At least 60 days prior to any planned permitted activities for the upcoming calender year, a general description of all planned activities covered by this permit for the upcoming year, will be submitted in writing to the Service's Carlsbad Fish and Wildlife Office (CFWO), 2730 Loker Avenue West, Carlsbad, California 92008 (telephone: 760-431-9440; fax: 760-431-9618). The description of activities shall include: (1) estimated dates of occurrence; (2) purpose of activities; (3) numbers by sex and age class of sheep to be impacted by the activity.

ii. At least 14 days prior to any specific actions covered by this permit, the CFWO will be notified and a detailed description of the activity will be submitted by the applicant. Detailed descriptions shall include: (1) date of activity; (2) purpose of the activity and a clear description of methods, including the names of field personnel; (3) a map (U.S. Geological Survey (USGS) topographic map) depicting the location and extent of the area

included in the activity; (4) numbers by sex and age class of sheep to be impacted by the activity.

c. All possible precautions will be taken to avoid injuring sheep during the capture process.

d. Captures will be conducted using methods that have been proven to reduce the potential for injury to sheep given the specific set of circumstances during capture and processing, including; net-guns from helicopters, drop-nets, or tangle-nets. Qualified pilots will have prior helicopter wildlife capture experience.

e. If an animal is not captured within the allotted 5 minute pursuit time, the capture of that animal will be abandoned.

f. To minimize stress to sheep during processing, they will be blindfolded, hobbled, and retained in a sternal position.

g. Vital signs (temperature, pulse, and respiration) should be assessed immediately after capture and monitored during processing. Water will be available at both the capture and processing sites and used as necessary to cool animals.

h. Before greater than 25 percent of any single ewe group is captured in any single year, the CFWO will be notified and permission obtained to capture additional sheep within the ewe group.

i. Injections of MU-SE (vitamin E and selenium) and additional medications may be administered at the discretion of the on-site veterinarian(s) to address specific individual sheep needs.

i. If an animal is determined to be excessively stressed it will be released as quickly as possible, provided that it is in a stable condition.

j. In the event of significant injury or stress, qualified personnel and equipment will be available to provide immediate care.

k. Radio collared sheep will be monitored during the first 10 post-capture days to evaluate their health. All injuries and mortalities that occur during this time will be reported to CFWO within 24 hours of observation.

6. Within 45 days following completion of an aerial survey or capture, a report shall be submitted to the CFWO that includes: (1) a complete description of survey methods including the names of personnel, the hours surveyed per biologist per survey-day, the number and dates of surveys, survey routes; (2) the number, age, and sex captured; (3) the

processing time and number of samples collected per animal; and (4) a description of bighorn health, the type and amounts of any medications administered, any injuries noticed and whether the injuries were related to permit activities.

7. The number of individuals allowed to be incidentally injured or killed during performance of all permitted activities involving sheep is one in any calendar year. Sheep that have been injured unrelated to activities within the scope of this permit (e.g. bighorn sheep injured while crossing a road) and subsequently die in the care of the permittee or captive herd bighorn sheep which are euthanized, are not included in this count.

   a. Any incidental injury or killing shall be reported within 3 working days to the Service's Portland Regional Office (telephone: 503-231-2063; fax: 503-231-6243) and the CFWO (telephone: 760-431-9440; fax: 760-431-9618).

   b. In the event that the allowable take for an individual permit is exceeded due to serious injury or death during performance of permitted activities, the permittee must:

      i. Immediately cease the activity until reauthorized by the PRO, which may, after analysis of the circumstances of injury or mortality, revoke or amend this permit.

      ii. Immediately notify the PRO and the appropriate field office. Within 3 working days, the permittee shall follow up such verbal notification in writing to each office with a copy to the California Department of Fish and Game (CDFG), Wildlife Management Division, 1416 Ninth Street, Sacramento, California 95814 (telephone: 916-654-4260).

      iii. With the notification, the permittee is to provide a report of the circumstances that led to the injury or mortality. A description of the changes in activity protocols that will be implemented to reduce the likelihood of such injury or mortality from happening again should be included, if appropriate. The incident should also be discussed in the annual report that is subsequently submitted.

   c. Reports of incidental injury or killing must include the date, time, precise location of the injured animal or carcass, and any other pertinent information such as cause of death or injury.

   d. In the event of a bighorn death during the performance of permitted activities, a necropsy will be performed immediately by qualified personnel or performed at the California Veterinary Diagnostic Laboratory in San Bernardino, California. Following the necropsy, preserve any dead specimens in accordance with standard museum practices. Before expiration of the permit, all preserved specimens will be properly labeled and deposited with one of the designated depositories. The

permittee shall supply the depository with a copy of this permit to validate that the specimens were taken pursuant to a permit. If the carcass is inaccessible a necropsy is not required, but a full description of the circumstances that precluded the necropsy must be included in the post-survey report.

8. Designated depositories:

The Bighorn Institute, Palm Desert, California; the Los Angeles County Museum of Natural History, Los Angeles, California; or the San Diego Natural History Museum, San Diego, California.

9. A copy of the annual report of activities shall be submitted to the CFWO by January 31, following each year this permit is in effect. The report shall be in the following format: (a) an introduction section addressing reasons and objectives for taking the species; (b) a methodology section addressing data collection and analysis procedures; (c) a results section that summarizes the data collected, including information on any other federally listed species detected while conducting activities authorized under this permit; and (d) a conclusion section that specifically provides recommendations for recovery of the species. If no activities occurred over the course of a year, indication of such shall be submitted as an annual report. The annual report shall include, but not be limited to:

i. The location of the survey area (1:250,000 scale) and PBS locations, delineated on a U.S. Geological Survey topographic map;
ii. Description of the health of animals encountered, including any injuries and whether the injuries were related to permit activities;
iii. Sizes of populations;
iv. Summary presentations and brief discussions of significant research results;
iv. Description of how the actual activities conducted under this permit varied from the planned activities submitted as per 5 (b); and
v. Other pertinent information regarding the status of the species.

3-26-01
Date

Jennifer L. O'Brien
FOR Chief, Endangered Species